Candidates for the natural science scholarship at Clare College are to be examined in chemistry and chemical physics, without restrictions in age.

At King's College any candidates for honours are now received, a great improvement on the old exclusiveness. The Vintner exhibition for natural science is worth 90*l.* a year, but only candidates under twenty, and British subjects, may compete, also undergraduates of the College in their first or second year. The scholarships are to be held till M.A. standing, or until election to a fellowship. Candidates in natural science must notify before March 1 in what branches of natural science they wish to be examined.

Every encouragement is now offered to selected candidates for the Indian Civil Service.

It having been decided that there should be a memorial to Prof. Clerk Maxwell, it might be suggested that a Maxwell university scholarship in experimental and molecular physics would be a great benefit, as there are scarcely any mathematical or natural science competitions open to the University. Let it be given for a specified research, rather than spend it on a posthumous bust or portrait.

MANCHESTER.—Mr. J. E. A. Steggall, B.A., scholar of Trinity College, Cambridge, mathematical master at Clifton College, Bristol, has been appointed to the Fielden lectureship in mathematics in the Owens College, vacant by the appointment of Mr. A. T. Bentley, M.A., to the principalship of the Firth College, Sheffield. Mr. Steggall graduated as second wrangler in January, 1878, and subsequently gained the First Smith's Prize. There were twenty candidates.

WE have received a very favourable report from the Liverpool School of Science, which now numbers 800 students. Before long it is hoped that a central college may be established in Liverpool, from which all existing branches with extensions may be worked.

THE Kaiser Wilhelm University at Strassburg is seemingly becoming popular in Germany. During the last term the number of students rose to 810, this being the largest number reached since the University was inaugurated.

SCIENTIFIC SERIALS

Annalen der Physik und Chemie, No. 11, 1879.—This opens with a valuable contribution by Herr Hagenbach in support of Stokes's law, the validity of which has been somewhat controverted recently. The author regards Lommel's division of fluorescent bodies as based on no essentially different behaviour of them.—Some curious experiments on electric perforation of glass are described in papers by Herren Mach and Doubrava, and Herr Waltenhofen; the latter considers the phenomenon as "a mechanical work taking place at cost of the *vis viva* of the colliding air-molecules at the part perforated, and this transformation of energy is evidently more easily effected the stronger the molecular motions; which, when they meet an obstacle, are suddenly checked." Herr Doubrava also writes on the motion of plates between the electrodes of the Holtz machine.—A series of experiments, by Herr L. Weber, with electricity of high tension used in the telephone, seem to clear up some sources of error in like observations by other physicists, to give new proof of the availability of the telephone for observing weak periodic discharges of a conductor, and to illustrate the conception of Helmholtz and others as to electric movements in an induction circuit and electrolytes inserted in it.—The relations between velocity of rotation, resistance, current strength, and electromotive force, in the Gramme machine, are set forth by Herr Meyer and Herr Auerbach.—Other papers:—On the true theory of Fresnel's interference phenomena, by Herr F. Weber.—On the relation between galvanic resistance and specific heat, by Herr Auerbach.—On extra currents in iron wires, by Herr Herwig.—Experimental researches in determination of the indices of refraction of liquefied gases, by Herr Bleekrode.—Influence of temperature on tuning-forks, by Herr Kayser.—On galvanic conduction of metallic alloys, by Herr Elsässer.—On phosphorescence-phenomena, by Herr Stürtz.

Gazetta Chimica Italiana, fasc. x. 1879.—Researches on cobalt and nickel, and methods for distinguishing them when mixed, by Dr. Papasogli.—On the constitution of ellagic acid, by S. Schiff.—On determination of acetyl by means of magnesia, by the same.—Ozone with some noble metals, by Prof. Volta.—On paraoxymethylphenyl-cinnamic acid, and on oxymethylstilbene, by Dr. Oglialoro.—On the action of perchloride of phosphorus on molybdic anhydrides, by S. Piutti.—On some derivatives of naphtols, by S. Marchetti.—Researches on the diffusion of copper in the animal kingdom, by Dr. Giunti.—On amines corresponding to a toluic alcohol, by Dr. Spica.—On the preparation of hydroxylamine, by Dr. Bertoni.—Transformation of hydroxylamine into nitrous and nitric acid, by Dr. Bertoni.—On an easy and rapid process for determining at any time the nitrogen, sulphur and chlorine, in organic substances, by Dr. Spica.

Bulletin de l'Académie Royale des Sciences de Belgique, Nos. 9 and 10.—M. Montigny here describes a case of supernumerary rainbows which were only visible at the lower extremities of the principal bow (a phenomenon overlooked in works on meteorology).—M. van Mensbrugghe shows how the ventral and nodal appearances of liquid veins may be explained on principles he lately enunciated.—Dr. Jorissen contributes a note on the employment of chloride of zinc as reagent for certain alkaloids, glucosides, &c.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, December 18, 1879.—"Chemico-Electric Relations of Metals in Solutions of Salts of Potassium," by G. Gore, LL.D., F.R.S.

In this investigation the author has determined the chemico-electric positions of about twenty-four elementary substances in a number of solutions, of various degrees of strength, and both cold and hot, of chloride, bromide, iodide, and cyanide of potassium, and has drawn from the results of the experiments various general conclusions. The results are exhibited in a series of tables. The experiments were made with the intention of also determining by means of a capillary electrometer the quantitative differences of electromotive force between each two consecutive elementary substances of the entire series; but after making many attempts the author was unable to construct such a form of that instrument as might be relied upon for accurately measuring such differences.

Chemical Society, December 18, 1879.—Mr. Warren De La Rue, president, in the chair.—The following papers were read:—On the specific volume of water of crystallisation, by T. E. Thorpe and J. J. Watts. Some years ago Playfair and Joule pointed out that the volumes of certain highly hydrated salts, for example, sodium carbonate with ten molecules of water, are equal to that of the water, considered as ice, which they respectively contain. This law does not hold good for salts less highly hydrated. The authors of the present paper have determined the precise relations between the specific volumes of various sulphates of copper, magnesium, zinc, nickel, cobalt, iron, and manganese, and their respective degrees of hydration. They conclude that in the case, at least of the so-called magnesian sulphates, the volume occupied by the several molecules of water varies with the degree of hydration. The first molecule occupies less bulk than any other, its mean relative value is 10·7, the value of the second molecule being 13·3, of the third 14·5, the fourth 15·4, the fifth 15·6, the sixth 15·7, the seventh 16·2. These results accord with the fact that the different molecules of water in a hydrated salt are held with various degrees of tenacity. The authors point out the importance of estimating the amounts of heat resulting from the combination of successive molecules of water.—Note on the formation of ozone during the slow oxidation of phosphorus, by H. McLeod. The active substance formed during the slow oxidation of phosphorus is probably either ozone or peroxide of hydrogen. Air in which phosphorus is slowly oxidising, was drawn through a U-tube 9½ inches long (filled with fragments of glass containing in succession sodic carbonate, a mixture of potassic bichromate and sulphuric acid, and potassic permanganate), the U-tube was at the temperature of the air or at 100° C., in both cases the gas which passed through rendered blue a solution of potassic iodide and starch, hydroxyl under these circumstances would be completely decomposed. In another series of experiments the gas was passed through a narrow U-tube heated to 150° to 200° C., but no water was formed. It is extremely improbable that ozone and hydroxyl are simultaneously formed, as these substances decompose each other. The author therefore concludes that the gas obtained during the slow oxidation of phosphorus possesses the properties of ozone and not those of hydroxyl, the only known peroxide of hydrogen.—On the analysis of organic bodies containing

nitrogen, by W. H. Perkin. The author proposes to substitute for the freshly reduced metallic copper, which has several disadvantages (such as being hygroscopic, occluding iron, &c.), roughly powdered or granulated potassic chromate. About 4 to 7 inches of this substance are placed in the front of the combustion tube and maintained at a low red heat. All nitrous fumes are completely absorbed, whilst no effect is produced on the carbonic acid determination. The salt can be readily dried. It also absorbs sulphurous acid completely.

Linnean Society, December 18, 1879.—Prof. Allman, F.R.S., president, in the chair.—Mr. B. Daydon Jackson exhibited series of the various editions of Dillenius's "Historia Muscorum," Oxford, 1741, and its reprint, Edinburgh, 1811, in illustration of the following communication.—The Rev. J. M. Crombie read a paper on the lichens of Dillenius's "Historia Muscorum," as illustrated by his herbarium. This latter collection is preserved in the Botanic Gardens at Oxford, and the specimens, though well nigh 150 years old, are still in a fair state of preservation. The intrinsic value of Dillenius's material rests in the fact of the earlier writers on cryptogamic botany referring constantly, in their synonomy and nomenclature, to his descriptions; hence the importance of an accurate knowledge of the collection, to judge from a present standard, in how far his descriptions and figures agree with the specimens themselves. No systematic examination has hitherto been made, though some old writers have compared certain of the forms. While the Dillenian lichens identified are, as a whole, now found to bear considerable accuracy with his descriptions and figures, yet serious mistakes have crept in. Mr. Crombie gives technical data and details of the series, and adds a conspectus for reference to workers on lichens who have not Dillenius's volumes and figures at hand.—Prof. Allman then gave a description of what appears to be true sense-organs in the hydroids. In one form the organ in question is a bulb, with rod-like structures and a series of radiating filaments. These latter terminate in conical bodies containing filaments which resemble thread cells, though differing physiologically. Another form is met with in a Medusa (*Gemmellaria*), where free, club-topped filaments constantly in motion are attached to the tentacles, and possess sacs with thread-cells, but incapable of being exserted. Prof. Allman suggests the term *Podocysts* for these, and says, from his observations in *Myriothela* and other genera, they have a wide extension among the hydroids.—Mr. H. Seebohm was elected a Fellow of the Society, and Messrs. A. D. Bartlett (Zool. Gard.), N. E. Brown (Kew Herb.), and F. H. Waterhouse (Librarian, Z.S.) were balloted for and elected Associates.

Entomological Society, December 3, 1879.—J. W. Dunning, F.L.S., vice president, in the chair.—Mr. Howard Vaughan exhibited a series of extreme varieties of *Lycæna corydon* which had been taken at Dover.—Mr. W. L. Distant exhibited a hitherto unrecorded variety of *Danais plexippus* (commonly known as *D. archippus*) received from Antigua.—Mr. T. R. Billups exhibited some rare British beetles, and a specimen of *Carabus auratus* taken in the Borough Market.—Mr. C. O. Waterhouse communicated some interesting details as to tenacity of life in *Curculio cleonus*.—The Rev. H. S. Gorham read a paper entitled "Materials for a Revision of the Lampyridæ." Mr. Bates, in connection with the light-emitting power of this family, remarked that certain species of Longicorns mimicked Lampyrids with great exactness, the light-giving segments of the latter being perfectly represented in the Longicorns, although destitute of phosphorescent power.—Mr. J. W. Slater communicated a paper on certain minute characters of insects with reference to the theory of evolution.—A communication was received from Mr. P. H. Gosse, on *Papilia homerus*, its ovum and larva, and a paper from Mr. Roland Trimen, on some hitherto undetermined butterflies inhabiting Southern Africa.

Geological Society, December 17, 1879.—Henry Clifton Sorby, F.R.S., president, in the chair.—James Booth, Edgar S. Cobbold, D. M. Ford Gaskin, John Farran Penrose, Stephen Seal, Thomas Tate, and Richard Taylor were elected Fellows of the Society.—The following communications were read:—A contribution to the physical history of the cretaceous flints, by Surgeon-Major G. C. Wallich, M.D. The author described the origin, the mode of formation, and the cause of the stratification of the chalk flints. Taking as the basis of his conclusions the fact brought to notice by him in 1860, namely, that the whole of the protozoan life at the sea-bed is strictly limited to the immediate surface-layer of the muddy deposits, he pointed out in detail the successive stages of the flint-formation, from the period when the chief portion of the silica of which they are composed, was eliminated from the ocean-water by the deep-sea sponges to the period when it became consolidated in layers or sheets conforming to the stratification of the chalk. In relation to this subject the author claimed to have sustained the following conclusions:—1. That the silica of the flints is derived mainly from the sponge-beds and sponge-fields, which exist in immense profusion over the areas occupied by the globigerine or calcareous "ooze." 2. That the deep-sea sponges, with their environment of protoplasmic matter, constitute by far the most important and essential factors in the production and stratification of the flints. 3. That whereas nearly the whole of the carbonate of lime, derived partly from foraminifera and other organisms that have lived and died at the bottom, and partly from such as have subsided to the bottom only after death, goes to build up the calcareous stratum, nearly the whole of the silica, whether derived from the deep sea sponges or from surface protozoa, goes to form the flints. 4. That the sponges are the only really important contributors to the flint-formation that live and die at the sea-bed. 5. That the flints are just as much an organic product as the chalk itself. 6. That the stratification of the flint is the immediate result of all sessile protozoan life being confined to the superficial layer of the muddy deposits. 7. That the substance which received the name of "*Bathybius*," and was declared to be an independent living Moneron, is, in reality, sponge-protoplasm. 8. That no valid *lithological* distinction exists between the chalk and the calcareous mud of the Atlantic, and *pro tanto*, therefore, the calcareous mud may be, and in all probability is, "a continuation of *the* chalk-formation."—Undescribed fossil carnivora from the Sivalik Hills, in the collection of the British Museum, by P. N. Bose. This communication contained descriptions of nine species of carnivora from the ossiferous Sivaliks, together with an introduction, in which the age of the Sivalik fauna, and several matters of general interest, were briefly discussed. The species described were: *Machærodus sivalensis*, *M. palæindicus*, *Felis grandicristata*, *Hyæna sivalensis*, *H. felina*, *Viverra bakerii*, *Lutra palæindica*, *Canis curvipalatus*, and *C. cautleyi*. *Canis curvipalatus* is so named on account of the curvation of the palate. *C. cautleyi* is closely allied to the wolf, as is *Viverra bakerii* to the civet. The form of the forehead is peculiar in *Lutra palæindica*. In the form of the skull, the dimensions of the upper tubercular, &c., *Hyæna sivalensis* approximates to the living Indian hyæna (*H. striata*); but, in the absence or extremely rudimentary character of the postero-internal cusp in the lower carnassial, as well as in the entire absence of the anterior accessory cusps in the upper and the first two lower premolars, the Sivalik species comes closer to *H. crocuta*. *H. felina* differs from all other species of hyæna, living or extinct, in the absence of the upper premolar 1. *Felis grandicristata*, which was of about the same size as some of the larger varieties of the Royal Tiger, had the sagittal crest even more prominent than the *F. cristata* of Falconer and Cautley. *Machærodus sivalensis* was of about the same size as the jaguar. One of the specimens, on which this species is based, shows two molars in the deciduous dentition instead of three (as in the genus *Felis*). *M. palæindicus* was considerably larger than *M. sivalensis*. Both differ from all other known species of *Machærodus* in the form of the lower jaw, &c.

PARIS

Academy of Sciences, December 15, 1879.—M. Daubrée in the chair.—The following papers were read:—On some applications of elliptic functions, by M. Hermite.—Researches on the substance designated hydride of copper, by M. Berthelot. The amorphous substance precipitated in the reaction of hypophosphorous acid with sulphate of copper is not a true hydride; it contains constitutional water, oxygen, and phosphorus in considerable quantity.—On the cold of December and its influence on the temperature of the snow-covered ground, by MM. Becquerel. Snow alone does not preserve the bodies it covers from frost. It acts, indeed, as a screen, preventing radiation, and gives water at 0°, which filters through the ground; but under 0° it undergoes, like other bodies, by its conductivity, variations of temperature, and may transmit them, attenuated much, however, by reason of its thickness. But the presence of straw or the like under the snow may preserve organic bodies in the ground.—M. Pasteur stated that the bacteridium of anthrax, and the organism which produces the cholera of fowls, could both resist a temperature of 40° below zero.—On the variations of

the vertical, by M. D'Abbadie. In his observatory near the Pyrenees he has found the place of the vertical vary in only six hours, from 7″·4 to 2″·4, and he thinks the changes there do not depend on temperature (as M. Plantamour explains the phenomena he noted). The desirability of all astronomers publishing their observations on this subject is referred to.—Craniology of Australian races, by MM. Quatrefages and Hamy. The eighth volume of their "Crania Ethnica" completes the study of the Australians, and treats partly of the African negro races. The Australian continent seems to contain only two indigenous races, one forming the Australian race proper, the other distinguished as *neanderthaloid*, and represented by a small number of homogeneous and disappearing tribes. The craniological characters are indicated. The male natives of the interior have considerably larger cranial capacity than those of the coast, but the women have slightly less.—Observations during a voyage in Equatorial America, by M. Crévaux. The River Ica (one of the affluents of the Amazon) is navigable for 800 geographical miles, as far as the outliers of the Andes.—New æroplane, moved by a compressed air-engine; experimental determination of the work necessary to make it fly, by M. Tatin. The apparatus resembled that of Henson's (1843), except in dimensions, a sort of kite moved by screw propellers. It rises and describes a curve in the air, coming to the ground again. The horse-power was about 1 per 50 kg.—Reply to M. Balbiani, on the presence of the winter egg of phylloxera in the ground, by M. Boiteau.—A head of jacquez grafted on a French vine, by M. de Lafitte.—On a class of functions connected with the functions of M. Heine, by M. Appell.—On measurement of the intensity of absorption lines and dark lines of the solar spectrum, by M. Gouy. The problem is reduced to making a pure spectrum, and measuring the intensity of different portions of it.—On a curare of the unstriped muscles, by MM. Couty and De Lacerda. This kills by lowering the arterial tension, and consequent cessation of the circulation. The effects were got with preparations from *Strychnos gardnerii* and *S. triplinervia*.—Alterations of the cutaneous nerves in a case of vitiligo, by MM. Leloir and Chabrier.—Researches on vaso-dilator nerves contained in various branches of the fifth pair, by MM. Jolyet and Laffont.—On the chemical composition of bones in arthropathy of the ataxic, by M. Regnard. Fat becomes abundant, and phosphate of lime is greatly diminished.—Researches on the mode of formation of the spinal fissure, by M. Dareste.—On a new form of vesicular worm found in a jerboa, by M. Mégnin.—New remarks on the Orthonectida, by M. Giard.—On the reproduction of marine algæ (Bryopsis), by M. Cornu.—On the influence of forests on rain currents traversing them, and the affinity of pines for vapours, by M. Fautrat. On an average the weight of aqueous vapour contained in 1 cub. metre above pines is 8·66 gr., and on bare ground at the same height 7·39 gr.; showing 1·27 gr. in favour of the pines. Above leafy trees the corresponding numbers are 8·46 gr. and 8·04 gr.; difference in favour of leafy trees 0·42 gr.—On a very intense hoar-frost observed at Angers on December 12 and 13, by M. Decharme. The temperature was − 8°·8 to − 6°·4; pressure 779 mm.; wind weak. The numerous long opaque needles of ice were all placed on one side of the branches, that opposite to the direction of the wind.—M. Jobert proposed a large celestial reflector, giving, in a dark chamber which might hold as many as a hundred observers, an enlarged image of heavenly bodies.

December 22, 1879.—M. Daubrée in the chair.—M. Faye presented his "Cours d'Astronomie nautique." His method is to bring all questions to two or three fundamental equations (which ever recur). The study of chronometers is treated with special care. The graphic solutions of Douwes's problem are expounded from a new standpoint.—Reply to M. St. Claire Deville's remarks on the temperature of decomposition of vapours, by M. Wurtz.—Observations on M. Berthelot's note entitled "Researches on the Substance named Hydride of Copper," by M. Wurtz. He adheres to his formula, Cu_2H_2. The presence of a small quantity of copper and phosphate of copper in the product explains at once the existence of small quantities of oxygen and phosphorus, and the deficit in hydrogen.—On a new hydride of silicium, by M. Ogier. He submitted some siliciuretted hydrogen to the electric *effluve*. After some time the gas is wholly destroyed; a yellow coat forms on the walls of the tube, and the gaseous volume (pure hydrogen) increases to a sensibly constant limit. The composition of the deposited matter (arrived at from comparing the volume of the siliciuretted hydrogen and the resulting hydrogen), appeared to be Si_2H_3. The body is thus a sub-hydride of silicium corresponding to sub-oxide of carbon, or to crotonylene. (Its properties are specified.) Similar effects are got with the *effluve* acting on arseniuretted hydrogen; a solid hydride As_2H is formed, corresponding to solid phosphide of hydrogen, P_2H.—Comparative studies on ptyaline and diastase, by M. Defresne. These two bodies are not identical physiologically. Ptyaline saccharifies starch in the mixed gastric juice as well as in the mouth; it is only paralysed an instant in pure gastric juice, and recovers its action in the mixed juice and in the duodenum. Diastase or maltine is destroyed immediately in chlorhydic solutions or in pure gastric juice, and after having passed into the mixed juice, it is profoundly altered, for, if again dissolved with starch, it no longer saccharifies it.—M. Debrun submitted a new capillary electrometer, a modification of Lippmann's, a microscope being dispensed with, and the mercury surface whose displacements are observed being in a graduated tube inclined at an angle of 10° to the horizon. The change of level is about 75 mm. for a variation of one volt (giving, with a Vernier, a sensibility of at least $\frac{1}{100}$ of a volt).—On the determination of the elements of a vibratory movement; measurement of periods, by M. Mercadier. Two very fine styles are fixed (parallel, and one behind the other, and very near it, in a horizontal plane) to the two vibrating bodies; and their shadows with light coincide on a vertical screen. When the bodies vibrate vertically, a certain number of lines result in the projection, some of which are broader than others, and seem fixed. (These effects are investigated).—Researches on nitrification, by MM. Schloesing and Muntz. The conditions affecting the production of nitrates are set forth; temperature, access of oxygen, humidity, weak alkalinity, presence of various organic matters, &c. *Nitrites* are formed in general when the conditions of temperature and aëration are not advantageous.—On dioxyethylmethylene, and on the preparation of chloride of methylene, by M. Greene.—On two substances, palmelline and characine, extracted from fresh-water algæ, by Mr. Phipson. It is characine that gives plants of the *chara* genus their marshy odour; it is formed by the plant during life, and is not a product of decomposition. It is lighter than water, and is a species of camphor, forming very thin pellicles on the water surface, but dissolving very little in it.—Habits and parthenogenesis of *Halictus*, by M. Fabre. These animals have two generations annually, one in spring, and sexual, from mothers which, fecundated in autumn, have passed the winter in their cells; the other in summer, and due to parthenogenesis.—On tubercular inflammation of the internal coat of the vessels in tubercular meningitis, by M. Cornil.—On the structure of the bark and wood of *strychnos*, by M. Planchon.

CONTENTS